

LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA20 | Curdworth to Middleton

Data appendix (AG-001-020)

Agriculture, forestry and soils

November 2013

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Appendix AG-001-020

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1 Introduction

- 1.1.1 The agriculture, forestry and soils appendices for the Curdworth to Middleton community forum area (CFA20) comprise:
- Soils and agricultural land classification surveys (Section 2);
 - Forestry (Section 3); and
 - Farm impact assessment summaries (Section 4).
- 1.1.2 Maps referred to throughout the agriculture, forestry and soils appendix are contained in the Volume 5 agriculture, forestry and soils map book.

2 Soils and agricultural land classification surveys

2.1 Background

- 2.1.1 The soils and agricultural baseline conditions reported have been established from desktop studies and site surveys.
- 2.1.2 Information gathered by desktop studies has related primarily to the identification of soil resources in the study area, the associated physical characteristics of geology, topography and climate which underpin the assessment of agricultural land quality, and the disposition of land uses. The main sources of information have included:
- National Soil Map¹;
 - Soils and Their Use in Midland and Western England²;
 - Solid and superficial deposits from the Geology of Britain viewer³;
 - Gridpoint meteorological data for Agricultural Land Classification of England and Wales⁴;
 - Provisional Agricultural Land Classification of England and Wales (1:250,000)⁵;
 - Likelihood of Best and Most Versatile Agricultural Land (1:250,000)⁶;
 - Agri-environment schemes⁷;
 - Aerial photography from Google Earth; and
 - On-site soil and Agricultural Land Classification surveys.
- 2.1.3 Information gathered by field survey⁸ has related to the enhancement of desk-based information on soils and agricultural land quality, and the engagement with landowners and tenants to establish the nature and extent of agricultural, forestry and related rural enterprises.
- 2.1.4 Field and other data were interpreted using the MAFF's 1988 Revised Guidelines and Criteria for Grading the Quality of Agricultural Land⁹.
- 2.1.5 Information obtained from farm impact assessment interview surveys has been taken as a factual representation of local agricultural and forestry interests and has not been subject to further evaluation.

¹ Cranfield University (2001), *The National Soil Map of England and Wales 1:250,000 scale*. Cranfield University: National Soil Resources Institute.

² Soil Survey of England and Wales (1984), *Soils and Their Use in Midland and Western England*. Harpenden.

³ British Geological Survey. <http://bgs.ac.uk/geologyofbritain/home/html>.

⁴ Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

⁵ Ministry of Agriculture, Fisheries and Food (1983), *Agricultural Land Classification of England and Wales (1:250,000)*.

⁶ Department for Environment, Food and Rural Affairs (2005), *Likelihood of Best and Most Versatile Agricultural Land (1:250,000)*.

⁷ Multi-Agency Geographical Information for the Countryside (MAGIC) available on line @ www.magic.gov.uk.

⁸ Hodgson, J.M. (1997), *The Soil Survey Field Handbook*. Soil Survey Technical Monograph no. 5, Silsoe.

⁹ Ministry of Agriculture, Fisheries and Food (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

2.2 Soils and land resources

2.2.1 This part of the technical appendix describes the findings of a desktop study and targeted soil survey and Agricultural Land Classification (ALC) survey that identified existing soil and agricultural land resources in the study area.

2.2.2 The location and extent of different soil types and agricultural land in the different ALC grades are influenced by topography and drainage, and by geology and soil parent materials, which are described in turn in the following sections. This section then provides a description and distribution of the main soil types encountered along the study corridor.

Topography and drainage

2.2.3 The arterial drainage in the Curdworth to Middleton area is provided by the River Tame, Birmingham and Fazeley Canal, Langley Brook, Gallows Brook and their tributaries. The Proposed Scheme will cross the River Tame and the Birmingham and Fazeley Canal. It will then run parallel to the River Tame, as the valley continues northwards to Tamworth. Drainage is provided by several brooks flowing to the River Tame, including Langley Brook and Gallows Brook in the north of this area. The topography is dominated by the lowland within the valley of the River Tame at an elevation of between 70m and 85m above Ordnance Datum (AOD), except north-east of Curdworth near junction 9 of the M42 motorway, where the land rises to 103m AOD.

Geology and soil parent materials

2.2.4 Superficial deposits are present across much of the study area. Alluvium, variably composed of clay, silt, sand and gravel, surrounds the River Tame in the south of the study area and Langley Brook and Gallows Brook in the north. River terrace deposits, comprising predominantly sand and gravel, extend northwards from the River Tame and underlie much of the Proposed Scheme between the Birmingham and Fazeley Canal and Gallows Brook at the northern extent of the study area.

2.2.5 A cover of glacial deposits extends across an area of higher elevation to the north of the River Tame and head deposits, variably comprising clay, silt, sand and gravel, underlie the Proposed Scheme around the area of the Leeds spur and are present in isolated pockets elsewhere in the study area. These superficial deposits give rise to mainly clayey soils.

2.2.6 Bedrock of the Mercia Mudstone Group underlies the whole of the study area. Mercia Mudstone typically comprises weak red brown silty mudstone with minor amounts of carbonate and gypsum when unweathered. Occasional beds of dolomitic siltstone occur within the Mercia Mudstone which are generally thin and, when unweathered, are a medium strong rock. These soil forming materials give rise to clayey soils also.

2.2.7 A list of geological strata occurring within the study area is provided in age order in Table 1 and shown on Map WR-02 (Volume 5).

Table 1: Bedrock and soil forming materials

Formation	Composition/soil parent material
Superficial deposits	
Alluvium	Clay, silt, sand and gravel
River Terrace Deposits	Sand and gravel
Glaciofluvial Deposits	Sand and gravel
Glaciolacustrine Deposits	Clay and silt
Head Deposits	Clay, silt, sand and gravel
Bedrock	
Mercia Mudstone Group	Red mudstones and subordinate siltstones

Description and distribution of soil types

- 2.2.8 The characteristics of the soils are described by the Soil Survey of England and Wales that accompanies the National Soil Map. The soils are grouped into soil associations of a range of soil types (soil series) and are summarised in Table 2, and their distribution is shown on Map AG-02-020 (Volume 5).

Table 2: Soil associations

Soil association: code shown on Map series AG-02	Soil association: name	Description	Wetness class
543	Arrow	Deep permeable sandy loam soils affected by groundwater	I-II
572f	Whimple 3	Reddish medium clay loam or silty clay loam over clayey soils with slowly permeable subsoils and slight seasonal waterlogging; similar slowly permeable seasonally waterlogged soils on lower slopes, and clayey soils on brows	II-III
711c	Brockhurst 2	Slowly permeable seasonally waterlogged reddish medium or heavy clay loam or silty clay loam over clayey soils; some reddish clayey alluvial soils affected by groundwater	III
711n	Clifton	Slowly permeable seasonally waterlogged reddish medium clay loam and sandy loam soils, and similar soils with slight seasonal waterlogging; some deep sandy loam soils seasonally affected by groundwater	II-III
813a	Midelney	Stoneless clayey soils mostly overlying peat, variably affected by groundwater	III-IV
831c	Wigton Moor	Permeable clay loam and sandy loam soils variably affected by groundwater depending on altitude	I-III

- 2.2.9 As shown in Table 2, the National Soil Map shows six principal soil types within this area:

- the Arrow association is mapped on the river terrace and glacial outwash deposits. The dominant soil type has deep permeable sandy loam topsoils and subsoils variably affected by groundwater with sands and gravels at depth.

They experience slight seasonal waterlogging, i.e. Wetness Class¹⁰ (WC) II, with lower lying areas having more prolonged waterlogging (WC III);

- land overlying reddish mudstones, where the route will cross the M42 motorway, has soil named as the Whimple 3 association, with medium clay loam or medium silty clay loam topsoils and upper subsoils in thin superficial drift. There is generally slight seasonal waterlogging on this land (WC II) but, on lower slopes, soils are more seasonally waterlogged (WC III to IV);
- land in the valley of Langley Brook has soils of the Brockhurst 2 association developed on mudstones with thin superficial drift. Topsoils and upper subsoils tend to be medium clay loams or medium silty clay loams, but the slowly permeable clayey lower subsoils cause the dominant soils to be seasonally waterlogged (WC III to IV). Narrow strips of clayey alluvium on minor valley floors, too small in extent to be identified separately on Map AG-02-020 (Volume 5), occur within this association;
- extensive soils in deep reddish light and medium loamy drift occur through most of Middleton parish in the Clifton association. They have sandy clay loam and medium clay loam topsoils and, where slowly permeable, are seasonally waterlogged (WC III to IV). Locally, they are associated with deep light loamy soils affected by groundwater. Some similar reddish medium clay loam topsoils and subsoils with only slight seasonal waterlogging occur on naturally better draining land (WC II);
- soils on the Tame floodplain are named as the Middelney association which comprises heavy clay loam and heavy silty clay loam topsoils over mainly stoneless clays and silty clays with peat and gravel in places. They are affected by groundwater and can be wet for long periods (WC IV to V); and
- finally, low-lying river terraces north of the M42 have soils of the Wigton Moor association. These soils comprise deep, sandy clay loam topsoil or medium clay loam topsoil over similarly textured subsoil which are variably affected by groundwater, with drier soils on slightly raised sites (WC II to III).

2.3 Soils and land resources

Agricultural land quality

- 2.3.1 A review of available ALC information has been undertaken to ascertain the land quality within the study area. The review also sought to identify the extent of existing detailed post-1988 ALC information to ensure that surveys are not repeated unnecessarily.
- 2.3.2 The ALC assessment is based upon detailed surveys made to the east of Hunts Green (now partly a sports complex) that are available from the MAGIC website, and from field surveys carried out specifically for this project.

¹⁰ The Wetness Class (WC) of a soil is classified in Appendix II of Hodgson, J.M. (1977), *The Soil Survey Field Handbook*. Soil Survey and Land Research Centre, Technical Monograph No.5, according to the depth and duration of waterlogging in the soil profile and has six bands ranging from Wetness Class I (well drained) to Wetness Class VI (permanently waterlogged).

2.3.3 In areas where land access was not granted and no archived records were available, a professional judgement was made using published soil maps geological information.

2.3.4 In areas where access to land was not granted to access sites, ALC has been assessed from available information in the form of archived Soil Survey records obtained from the National Soil Resources Institute (NSRI) at Cranfield University. In areas where land access was not granted and no archived records were available, a professional judgement was made using published soil maps geological information.

Detailed agricultural land classification

2.3.5 A total of 133 new soil auger bores were made in the area affected by HS2. No archived soil survey records in this area exist at National Soil Resources Institute of Cranfield University.

2.3.6 Farms visited for the purpose of soil survey in 2012 and 2013 were: CFA20/1 Dunton Hall, CFA20/2 Mullengrove Farm, CFA20/5 Rye Farm and Cuttle Mill, CFA20/11 Land off Crowberry Lane, CFA20/12 Crowberry Stables, CFA20/13 Bullock End and CFA20/14 Land north of Middleton. In addition the following farms that span the CFA boundary were surveyed: CFA19/8 Newlands Farm and CFA21/3 Wiggins Hall.

2.3.7 The principal physical factors influencing agricultural production and land quality are climate, site and soil, and the interactions between them.

2.3.8 Soil profiles were examined using an Edelman (Dutch) auger and a spade. Where soils were stony or dry a 2.5cm diameter screw auger was used to enable deeper penetration. At each observation point the following characteristics were assessed for each soil horizon up to a maximum of 120cm where possible, or to any impenetrable layer:

- soil texture;
- significant stoniness;
- colour (including local gley and mottle colours);
- consistency;
- structural condition;
- free carbonate; and
- depth.

2.3.9 Soil available water capacity, relevant to the assessment of drought risk, was estimated from texture, structure, organic matter content, stone content and profile depth.

Agro-climatic limitations

2.3.10 The local climatic factors have been interpolated from the Meteorological Office's database (Met Office 1989) held in the Landis climatic database at Cranfield University¹¹ at 1km intervals along the line of the track. The average of the parameters

¹¹ <http://archive.defra.gov.uk/foodfarm/landmanage/land-use/documents/alc-guidelines-1988.pdf> Accessed Aug 2013.

is given in Table 3. There is little variation across the area: FCDs are within the narrow range 150 to 154 days; average annual rainfall (AAR) is from 651mm to 673mm; moisture deficits are 97mm to 101mm for wheat and 85mm to 91mm for potatoes.

Table 3: Interpolated agro-climatic data

Climatic parameter	Sewage Works, River Tame (SP1909 9152)	Dunton Hall/A4097 (SP1916 9350)	Middleton (SP1833 9848)
Altitude (m)	78	102	81
Average annual rainfall (mm)	651	673	656
Accumulated Temperature >0°C (Jan-June)	1394	1366	1388
Field Capacity Days (days)	152	154	150
Average Moisture Deficit, wheat (mm)	100	97	101
Average Moisture Deficit, potatoes (mm)	90	85	91

- 2.3.11 Climate itself does not place any limitation upon the land in this part of the West Midlands, but the interactions of climate with soil characteristics are important in determining the wetness and droughtiness limitations of the soil.
- 2.3.12 The influence of climate on soil wetness is assessed by reference to median Field Capacity Days (FCD) when the soil moisture deficit is zero, WC and topsoil texture. Soil WC was inferred from the matrix colour, presence or absence of, and depth to, greyish and ochreous gley mottling and/or poorly permeable subsoil layers at least 15cm thick. The ALC grade according to soil wetness was determined by following the methodology set out in the ALC Guidelines (October, 1988) and the information in the Table 4.

Table 4: ALC grade according to soil wetness – mineral soils (based on Table 6 of ALC Guidelines, October 1988)

Wetness class	Texture ¹ of the top 25cm	Field capacity days				
		<126	126-150	151-175	176-225	>225
I	S ² LS ³ SL SZL	1	1	1	1	2
	ZL MZCL MCL SCL	1	1	1	2	3a
	HZCL HCL	2	2	2	3a	3b
	SC ZC C	3a(2)	3a(2)	3a	3b	3b
II	S ² LS ³ SL SZL	1	1	1	2	3a
	ZL MZCL MCL SCL	2	2	2	3a	3b
	HZCL HCL	3a(2)	3a(2)	3a	3a	3b
	SC ZC C	3a(2)	3b(3a)	3b	3b	3b
III	S ² LS SL SZL	2	2	2	3a	3b
	ZL MZCL MCL SCL	3a(2)	3a(2)	3a	3a	3b
	HZCL HCL	3b(3a)	3b(3a)	3b	3b	4
	SC ZC C	3b(3a)	3b(3a)	3b	4	4
IV	S ² LS SL SZL	3a	3a	3a	3b	3b

Wetness class	Texture ¹ of the top 25cm	Field capacity days				
		<126	126-150	151-175	176-225	>225
	ZL MZCL MCL SCL	3b	3b	3b	3b	3b
	HZCL HCL	3b	3b	3b	4	4
	SC ZC C	3b	3b	3b	4	5
V	S LS SL SZL	4	4	4	4	4
	ZL MZCL MCL SCL	4	4	4	4	4
	HZCL HCL	4	4	4	4	4
	SC ZC C	4	4	4	5	5

Soils in Wetness Class VI – Grade 5

Texture key: S – sand; LS – loamy sand; SL – sandy loam; SZL – sandy silt loam; ZL – silt loam; MZCL – medium silty clay loam; MCL – medium clay loam; SCL – sandy clay loam; HZCL – heavy silty clay loam; HCL – heavy clay loam; SC – sandy clay; ZC – silty clay; C – clay

¹ For naturally calcareous soils with more than 1% CaCO₃ and between 18% and 50% clay in the top 25cm, the grade, where different from that of other soils, is shown in brackets.

² Sand is not eligible for Grades 1, 2 or 3a.

³ Loamy sand is not eligible for Grade 1.

- 2.3.13 Droughtiness is determined by comparing crop-adjusted available water (AP), with the moisture deficit (MD) for the locality for wheat and potatoes (MAFF 1988 Appendix 4). Grading of the land can be affected if the AP is insufficient to balance the MD and droughtiness occurs. The availability of irrigation can improve grading by one division where appropriate. However, irrigation is not common practice for grass cereals and oil seed rape (OSR). The calculation used in the ALC Guidelines (October, 1988)⁹ to determine the severity of this limitation is given below in Figure 1.

Site limitations

- 2.3.14 The assessment of site factors is primarily concerned with the way in which topography influences the use of agricultural machinery and, hence, the cropping potential of land. Gradient and micro relief, with complex changes of slope angle or direction over short distances, are not considered limiting in the study area.
- 2.3.15 Flooding in the study area is limited to the floodplains of the several brooks rising in the west flowing to the Tame, including the Langley Brook and Gallows Brook in the north. This is a potential limitation but its incidence is difficult to ascertain. Flood risk is determined by the extent, duration, frequency and timing of flooding events which may not have been recorded. However, the published flood maps by the Environment Agency can be used as a guide (see Map series WR-05, Volume 5) and the frequency and duration of annual flooding are not considered to be a limitation in this CFA.

Soil limitations

- 2.3.16 The main soil properties which affect the cropping potential and management requirements of land are texture, structure, depth, stoniness and chemical fertility. Together they influence the functions of soil and affect the water availability for crops, and soil drainage, workability and trafficability. The main soil characteristics within the area are the sandy loam, medium clay loam and sandy clay loam topsoil textures, in some places stony, over sand and gravel on river terraces and glaciofluvial sands and gravels. Poor structure in slowly permeable subsoils is a limitation on mudstones, and clayey and loamy, slowly permeable soils on floodplains. Limitations imposed by

soil depth and chemistry are not encountered. Figure 1: Methodology for calculating the severity of a droughtiness limitation to ALC grading (derived from MAFF, 1988)

$$AP \text{ wheat (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{50}) + \sum (EA_{vs} \times LT_{50-120})}{10}$$

where

TA_{vt} is Total available water (TA_v) for the topsoil texture

TA_{vs} is Total available water (TA_v) for each subsoil layer

EA_{vs} is Easily available water (EA_v) for each subsoil layer

LT_t is thickness (cm) of topsoil layer

LT_{50} is thickness (cm) of each subsoil layer to 50 cm depth

LT_{50-120} is thickness (cm) of each subsoil layer between 50 and 120 cm depth

Σ means 'sum of'.

$$AP \text{ potatoes (mm)} = \frac{TA_{vt} \times LT_t + \sum (TA_{vs} \times LT_{70})}{10}$$

where

LT_{70} is thickness (cm) of each subsoil layer to 70 cm depth

MB (Wheat) = AP (Wheat) - MD (Wheat)

MB (Potatoes) = AP (Potatoes) - MD (Potatoes)

Where

MB is the Moisture Balance

AP is the Crop-adjusted available water capacity

MD is the moisture deficit, as determined by the agro-climatic assessment.

Table 8 Grade according to droughtiness

Grade/ Subgrade	Moisture Balance limits (mm)		
	<i>wheat</i>		<i>potatoes</i>
1	+30	<i>and</i>	+10
2	+5	<i>and</i>	-10
3a	-20	<i>and</i>	-30
3b	-50	<i>and</i>	-55
4	<-50	<i>or</i>	<-55

Interactive limitations

- 2.3.17 The physical limitations which result from interactions between climate, site and soil are soil wetness, droughtiness and erosion. Each soil can be allocated a WC based on soil structure, evidence of depth of waterlogging and the number of Field Capacity Days. Where soil droughtiness is not an additional limitation the topsoil texture and stone content then determines the ALC grade. Thus, where there are 150 to 154 FCDs, then a typical soil in the Clifton association with a WC of III will be Subgrade 3a if the topsoil texture is a medium clay loam, and Grade 2 if it is a sandy loam.
- 2.3.18 Soil texture and structure determine the available water capacity of the soil profile. When calculated against the demands of a growing wheat and potato crop in the locality given by the climatic variable, the moisture deficit, a moisture balance is produced from which a droughtiness limitation can be assessed. The medium loam over clay soils of the Brockhurst 2 and Whimble 3 associations and the deep medium loams of the Clifton association have sufficient moisture reserves in an average year to have no droughtiness limitation, or only one that limits the land to Grade 2. Light loamy soils of the Arrow association, however, tend to have a smaller available water capacity and will be no better than Grade 2; where stoniness and subsoils of sand and gravel occur, these soils will be limited to Subgrade 3a.
- 2.3.19 Grade 2 land occurs on some of the sandy loam soils of Arrow association where depth to gravel is greatest and the droughtiness limitation is less severe.
- 2.3.20 Other sandy loams within the Arrow association which are shallower over sands and gravels, or have stony topsoils, or have a wetness limitation due to groundwater, are classed as Subgrade 3a. In the Brockhurst 2, Clifton and Whimble 3 associations, soils have a slowly permeable subsoil; where this occurs below 41cm depth and where soil wetness is accompanied by medium clay loam topsoil textures, the land is classed as Subgrade 3a as these features become the main limitation restricting the range of crops.
- 2.3.21 For the seasonally waterlogged soils of parts of the Brockhurst 2 and Middelney associations, where the slowly permeable layer is at shallow depth and/or the topsoil texture is a heavy clay loam, the wetness/texture limitation is more restrictive and the safe working period shorter, the land is classed as Subgrade 3b.

Summary of ALC assessment in CFA20

- 2.3.22 The characteristics of the soil series encountered within each association and a summary of the key characteristics relevant to the ALC grading in CFA20 are given in Table 5 to Table 10.

Table 5: Arrow association (543)

Deep permeable seasonally waterlogged sandy loam soils affected by groundwater.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 150)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Arrow		Glaciofluvial sands and gravels and river terrace	151	II	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness
	Quorndon	Glaciofluvial sands and gravels and river terrace	151	II-III	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness. Topsoil texture and WC locally
	Wick**	Glaciofluvial sands and gravels and river terrace	151	I	99 125-100	89 (85-75)	2 or 3a*	Droughtiness

* Where subsoil texture is loamy sand and or stone content is moderate to high then grade is restricted to 3a by drought.

** Wick series is a localised inclusion in this association.

Brief soil profile descriptions

Arrow	Quorndon	Wick
0-25cm Ap Dark brown, slightly stony sandy loam	0-25cm Ap Dark brown, slightly stony sandy loam	0-25cm Ap Dark brown, slightly stony sandy loam
25-50cm Bw Dark yellowish brown, slightly to moderately stony sandy loam; weak medium subangular blocky structure	25-50cm Bg1 Yellowish brown, mottled, slightly to moderately stony; weak medium subangular blocky structure	25-50cm Bw1 Dark yellowish brown, slightly to moderately stony sandy loam; moderate to weak medium subangular blocky structure
50-80cm Bwg Brown, slightly mottled, slightly or moderately stony sandy loam or loamy sand; weak coarse subangular blocky structure	50-80cm Bg2 Yellowish brown, mottled, slightly to moderately stony weak coarse subangular blocky or single grain structure	50-80cm Bw2 Yellowish brown slightly or moderately stony sandy loam or loamy sand; weak medium angular blocky structure or single grain
80-120 BCg Brownish yellow, mottled, slightly or moderately stony loamy sand or sandy loam; single grain structure	80-120cm Cg Pale to yellowish brown, mottled slightly to moderately stony loamy sand or sandy loam; single grain structure	80-120cm Cu Brownish yellow, slightly or moderately stony loamy sand or sandy loam; single grain structure

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Table 6: Whimble 3 association (572f)

Reddish loamy over clayey soils with slowly permeable subsoils and slight seasonal waterlogging. Some similar clayey soils on brows and slowly permeable, seasonally waterlogged soils on lower slopes.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 150)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Whimble		Mercian Mudstone Group	151	III	99 (115)	89 (105)	3a or 3b**	Topsoil texture and WC
	Brockhurst	Mercian Mudstone Group	151	III	99 (120)	89 (105)	3a or 3b**	Topsoil texture and WC
	Salop*	Till, Glaciolacustrine sands and gravels	151	III	99 (115)	89 (105)	3a or 3b**	Texture and WC

* Salop series is a local inclusion in this association.

** Where the topsoil texture is heavy clay loam, the Subgrade is 3b.

Brief soil profile descriptions

Whimble	Brockhurst	Salop
0-25cm Ap Dark brown slightly stony medium clay loam	0-20cm Ap Dark brown very slightly stony medium clay loam	0-25cm Ap Very dark greyish brown slightly stony medium or heavy clay loam
25-40cm Eb(g) Reddish brown, slightly mottled, slightly stony clay loam; moderate medium subangular blocky structure	20-40cm Eg Brown, mottled slightly stony medium clay loam; moderate medium subangular blocky structure	25-45cm Eg Brownish grey, mottled, slightly stony clay loam; moderate medium subangular blocky structure
40-60cm Bt(g) Reddish brown, slightly mottled, slightly stony clay loam; moderate to coarse prismatic structure	40-75cm Btg Reddish brown, mottled stoneless or very slightly stony clay; strong coarse prismatic structure	45-100 Btg Yellowish red, mottled, slightly stony; moderate to weak coarse prismatic structure
60-100cm 2BCtg Reddish brown, mottled, stoneless clay; Coarse prismatic structure	75-100cm BCtg Reddish brown mottled stoneless clay moderate coarse prismatic structure	100-120cm BCtg Reddish brown, mottled, slightly stony clay; massive structure
At 100cm Reddish mudstone	At 100cm Reddish mudstone	

Table 7: Brockhurst 2 association (711c)

Slowly permeable seasonally waterlogged reddish loamy over clayey soils and clayey soils. Some reddish clayey alluvial soils affected by groundwater.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 149)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Brockhurst		Mercian Mudstone Group	151	III	99 (120)	89 (105)	3a or 3b**	Topsoil texture and WC
	Whimble*	Mercian Mudstone Group	151	III	99 (115)	89 (105)	3a or 3b**	Topsoil texture and WC
	Salop*	Till, Glaciolacustrine sands and gravels	151	III	99 (115)	89 (105)	3a or 3b**	Topsoil texture and WC
	Fladbury***	Alluvium	151	III	99 (130)	89 (110)	3b	Topsoil texture and WC

* Whimble and Salop series are local inclusions in this association.

** Where the topsoil texture is heavy clay loam, Subgrade is 3b.

***Restricted to narrow valley floors.

Brief soil profile descriptions

Brockhurst	Whimble	Salop	Fladbury
0-20cm Ap Dark brown very slightly stony medium clay loam	0-25cm Ap Dark brown slightly stony medium clay loam	0-25cm Ap Very dark greyish brown slightly stony medium clay loam	0-15cm Ahg Dark greyish brown, mottled, stoneless clay
20-40cm Eg Brown, mottled slightly stony medium clay loam; moderate medium subangular blocky structure	25-40cm Eb(g) Reddish brown, slightly mottled, slightly stony clay loam; moderate medium subangular blocky structure	25-45cm Eg Brownish grey, mottled, slightly stony clay loam; moderate medium subangular blocky structure	15-60cm Bg Greyish brown, mottled, stoneless clay; strong coarse prismatic structure
40-75cm Btg Reddish brown, mottled stoneless or very slightly stony clay; strong coarse prismatic structure	40-60cm Bt(g) Reddish brown, slightly mottled, slightly stony clay loam; moderate to coarse prismatic structure	45-100 Btg Yellowish red, mottled, slightly stony; moderate to weak coarse prismatic structure	60-120 Cg Grey, mottled, stoneless clay; massive structure
75-100cm BCtg Reddish brown mottled stoneless clay moderate coarse prismatic structure	60-100cm 2BCtg Reddish brown, mottled, stoneless clay; coarse prismatic structure	100-120cm BCtg Reddish brown, mottled, slightly stony clay; massive structure	
At 100cm Reddish mudstone	At 100cm Reddish mudstone		

Appendix AG-001-022 | Soils and agricultural land classification surveys

Table 8: Clifton association (711n)

Slowly permeable seasonally waterlogged reddish loamy over clayey soils and clayey soils. Some reddish clayey alluvial soils affected by groundwater.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 150)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Clifton		Glaciofluvial sands and gravels and river terrace	151	III	99 (125)	89 (110)	3a or 3b*	Topsoil texture and WC
	Salwick	Glaciofluvial sands and gravels and river terrace	151	II	99 (125)	89 (110)	2	Texture and WC
	Quorndon	Glaciofluvial sands and gravels and river terrace	151	II-III	99 (125-100)	89 (85-75)	2 or 3a	Droughtiness. Topsoil texture and WC locally

* Where the topsoil texture is heavy clay loam, Subgrade is 3b.

Brief soil profile descriptions

Clifton	Salwick	Quorndon
<p>0-25cm Ap Dark greyish brown slightly stony medium clay loam or sandy clay loam</p> <p>20-35cm Eg Greyish brown, mottled slightly stony clay loam or sandy clay loam; weak medium subangular blocky structure</p> <p>35-80cm Btg Reddish brown, mottled, slightly stony clay loam or sandy clay loam; moderate coarse prismatic structure</p> <p>80-120cm BCtg Reddish brown mottled slightly stony clay loam weak coarse prismatic or massive structure</p>	<p>0-25cm Ap Dark brown slightly stony sandy loam or sandy clay loam</p> <p>25-40cm Eb(g) Brown, slightly mottled, slightly stony clay loam or sandy loam; weak subangular blocky structure</p> <p>40-700cm Bt(g) Reddish brown, slightly mottled, slightly stony clay loam; weak coarse prismatic structure</p> <p>700-120cm BCtg Reddish brown, mottled, slightly stony clay loam; massive structure</p>	<p>0-25cm Ap Dark brown, slightly stony sandy loam</p> <p>25-50cm Bg1 Yellowish brown, mottled, slightly to moderately stony; weak medium subangular blocky structure</p> <p>50-80cm Bg2 Yellowish brown, mottled, slightly to moderately stony weak coarse subangular blocky or single grain structure</p> <p>80-120cm Cg Pale to yellowish brown, mottled slightly to moderately stony loamy sand or sandy loam; single grain structure</p>

Table 9: Midelney association (813a)

Stoneless clayey soils often overlying peat and variably affected by groundwater. Flat land with risk of flooding.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 149)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat	Potatoes		
Midelney		River alluvium	151	III	99 (130)	89 (110)	3b	Topsoil texture and WC
	Fladbury	River alluvium	151	III	99 (130)	89 (110)	3b	Topsoil texture and WC
	Blithe*	River alluvium	151	III	99 (120)	89 (100)	3a	Topsoil texture and WC

*Blithe series of loamy alluvium over gravel is a localised inclusion in this association.

Brief soil profile descriptions

Midelney	Fladbury	Blithe
0-15cm Ahg Dark greyish brown, mottled, stoneless clay 15-65cm Bg Dark grey, mottled stoneless clay; strong coarse prismatic structure 65-120 "Oh Dark reddish brown stoneless humified peat; massive structure	0-15cm Ahg Dark greyish brown, mottled, stoneless clay 15-60cm Bg Greyish brown, mottled, stoneless clay; strong coarse prismatic structure 60-120 Cg Grey, mottled, stoneless clay; massive structure	0-15cm Ahg Dark greyish brown, mottled, stoneless medium clay loam 15-60cm Bg Greyish brown, mottled, stoneless medium clay loam; strong coarse prismatic structure 60-80 Cg Grey, mottled, stoneless clay loam; massive structure 80-120 2Cg Brown or greyish brown, mottled, gravely loamy sand or sandy loam; single grain structure

Appendix AG-001-022 | Soils and agricultural land classification surveys

Table 10: Wigton Moor Association (831c)

Permeable loamy soils variably affected by groundwater, the drier soils being on slightly raised sites. Generally flat land.

Main soil series	Ancillary soil series occurring locally	Geology	Average field capacity days (max 154 min 150)	Wetness class	Average moisture deficit and (available water) mm		ALC grade	ALC determinants
					Wheat (max 103 min 97)	Potatoes (max 93 min 85)		
Wigton Moor		Glaciofluvial sands and gravels and river terrace	151	III	99 (125)	89 (100)	3a	Topsoil texture and WC
	Quorndon	Glaciofluvial sands and gravels and river terrace	151	II-III	99 (125-100)	89 (85-75)	2 or 3a	Droughtiness. Topsoil texture and wetness locally
	Arrow	Glaciofluvial sands and gravels and river terrace	151	II	99 (125-100)	89 (85-75)	2 or 3a*	Droughtiness

* Where subsoil texture is loamy sand and or stone content is moderate to high then grade is restricted to 3a by drought.

Brief soil profile descriptions

Wigton Moor	Quorndon	Arrow
<p>0-25cm Ap Dark greyish brown, slightly stony medium sandy clay loam or clay loam</p> <p>25-50cm Bg1 Brown mottled slightly stony sandy clay loam or clay loam; medium subangular blocky structure</p> <p>50-80cm Bg2 Greyish brown with many ochreous mottles, moderately stony sandy clay loam or clay loam; weak coarse subangular blocky structure</p> <p>80-120cm Cg Brownish grey with many ochreous mottles, moderately stony sandy loam or sandy clay loam; single grain structure</p>	<p>0-25cm Ap Dark brown, slightly stony sandy loam</p> <p>25-50cm Bg1 Yellowish brown, mottled, slightly to moderately stony; weak medium subangular blocky structure</p> <p>50-80cm Bg2 Yellowish brown, mottled, slightly to moderately stony weak coarse subangular blocky or single grain structure</p> <p>80-120cm Cg Pale to yellowish brown, mottled slightly to moderately stony loamy sand or sandy loam; single grain structure</p>	<p>0-25cm Ap Dark brown, slightly stony sandy loam</p> <p>25-50cm Bw Dark yellowish brown, slightly to moderately stony sandy loam; weak medium subangular blocky structure</p> <p>50-80cm Bwg Brown, slightly mottled, slightly or moderately stony sandy loam or loamy sand; weak coarse subangular blocky structure</p> <p>80-120 BCg Brownish yellow, mottled, slightly or moderately stony loamy sand or sandy loam; single grain structure</p>

3 Forestry

- 3.1.1 Identification of forestry resources has primarily had regard to the National Forestry Inventory¹².
- 3.1.2 The area of land under forestry (i.e. trees and woodland) within 2km either side of the route centre line has been determined using GIS and is shown in Table 11.

Table 11: Area of woodland within the study area and construction boundary

	Area of forestry land (ha)	Forestry land as a % of total land area
Forestry land in study area	288.0	9
Forestry land within construction boundary	19.4	7

- 3.1.3 There are occasional stands of woodland at Middleton Pool-head Plantation, Mill Plantation and Lower Mill Plantation. As forestry land covers 9% of land in the study area, compared to the national average of 10%, the sensitivity of the forestry land resource in this study area is considered to be medium, as set out in the SMR Addendum (see Volume 5: Appendix CT-001-000/2).

¹² Forestry Commission (2001), *National Forest Inventory Woodland and Ancient Woodland* (as updated).

4 Assessment of effects on holdings

- 4.1.1 The effects on holdings have been assessed according to the methodology set out in the SMR Addendum (Volume 5: Appendix CT-001-000/2). The nature of impacts considered comprises the temporary and permanent land required from the holding, the temporary and permanent severance of land, the permanent loss of key farm infrastructure and the imposition of disruptive effects (particularly noise and dust) on land uses and the holding's operations. These impacts occur primarily during the construction phase of the Proposed Scheme.

Table 12: Summary of assessment of effect on holdings

Holding reference, name and description	Construction effects	Residual effects post restoration of land
CFA20\1 Dunton Hall 40.5ha of Mainly livestock (Sheep) High sensitivity to change	Land required: 22.7ha; 56% of holding required for construction. High Impact Severance: HS2 runs through centre of holding. For at least part of construction period, only access to severed land is likely to be via A4097, Kingsbury Road. Medium Impact Disruptive effects: kennels and commercial equestrian services immediately adjacent to construction area likely to be affected by noise Medium Impact	Land required: 17.1ha; 42% of holding taken. High Impact Severance: Overbridge 166-S1 can provide private access to severed land if access over 3rd party land is agreed and access ramp is constructed. Low Impact Infrastructure: loss of agricultural buildings; reinstatement of water supply / drinking trough systems ; restoration of drainage functionality; provision of access infrastructure, rationalisation of field boundaries; fencing High Impact
CFA20\2 Mullensgrove Farm 24.3ha of General cropping (cereals and potatoes) High sensitivity to change	Land required: 23.0ha; 95% of holding required for construction. Holding made unviable by extent of land take. High Impact Severance: N.A. (holding made unviable by construction activity) Negligible Impact Disruptive effects: N.A. (holding made unviable by construction activity) Negligible Impact	Land required: 15.9ha; 65% of holding taken by HS2 alignment and associated mitigation planting. High Impact Severance: single un-severed block of land returned to agriculture Negligible Impact Infrastructure: loss of residential, commercial and agricultural buildings; reinstatement of water supply / drinking trough and irrigation systems ; restoration of drainage functionality; fencing High Impact
CFA20\3 Wood to the north of Mullensgrove Farm 12.9ha of Woodland Medium sensitivity to change	Land required: 8.4ha; 66% of holding required for construction. High Impact Severance: The wood is severed by the Kingsbury Road Railhead and Leeds spur. Access will be needed form HS2 access track off Seeney Lane. Low Impact Disruptive effects: none identified Negligible Impact	Land required: 8.2ha; 63% of holding taken. High Impact Severance: The wood is severed by the Leeds spur. Access will be needed form HS2 access track off Seeney Lane. Low Impact Infrastructure: reinstatement of access; fencing Negligible Impact

Holding reference, name and description	Construction effects	Residual effects post restoration of land
<p>CFA20\4*</p> <p>Barn Covert</p> <p>6.3ha of Grassland</p> <p>Medium sensitivity to change</p>	<p>Land required: 6.3ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable.</p> <p>High Impact</p> <p>Severance: N.A. (whole of holding required for Kingsbury Road Railhead)</p> <p>Negligible Impact</p> <p>Disruptive effects: N.A. (whole of holding required for Kingsbury Road Railhead)</p> <p>Negligible Impact</p>	<p>Land required: 6.3ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable.</p> <p>High Impact</p> <p>Severance: N.A. (whole of holding required for Kingsbury Road Railhead)</p> <p>Negligible Impact</p> <p>Infrastructure: loss of agricultural buildings</p> <p>High Impact</p>
<p>CFA20\5</p> <p>Land at Cuttle Mill/Rye Farm</p> <p>404.7ha of General cropping (cereals and potatoes)</p> <p>High sensitivity to change</p>	<p>Land required: 27.8ha; 7% of holding required for construction.</p> <p>Low Impact</p> <p>Severance: Access beneath Birmingham and Fazley Canal Viaduct (167\L5) to severed land is needed throughout construction period (access along Bodymoor Heath Road not possible for agricultural vehicles). This will be managed under CoCP.</p> <p>Low Impact</p> <p>Disruptive effects:</p> <p>Negligible Impact</p>	<p>Land required: 16.9ha; 4% of holding taken.</p> <p>Negligible Impact</p> <p>Severance: Agricultural access under Birmingham and Fazley Canal Viaduct (167\L5) possible, assuming adequate horizontal clearance can be provided for agricultural vehicles around the embankment supporting the northern end of the viaduct.</p> <p>Low Impact</p> <p>Infrastructure: loss of agricultural buildings; reinstatement of irrigation systems ; restoration of drainage functionality</p> <p>High Impact</p>
<p>CFA20\6*</p> <p>Middleton House Farm</p> <p>93.2ha of Mainly arable</p> <p>Medium sensitivity to change</p>	<p>Land required: 31.0ha; 33% of holding required for construction.</p> <p>High Impact</p> <p>Severance: access via Bodymoor Road</p> <p>Medium Impact</p> <p>Disruptive effects: none identified</p> <p>Negligible Impact</p>	<p>Land required: 25.7ha; 28% of holding taken.</p> <p>High Impact</p> <p>Severance: access via Bodymoor Road</p> <p>Medium Impact</p> <p>Infrastructure: loss of agricultural buildings; reorganisation of access tracks ; restoration of drainage functionality</p> <p>High Impact</p>
<p>CFA20\9*</p> <p>Upper House Farm</p> <p>128.1ha of Mainly arable</p> <p>Medium sensitivity to change</p>	<p>Land required: 17.3ha; 14% of holding required for construction.</p> <p>Medium Impact</p> <p>Severance: Middleton parcel: see opposite.</p> <p>High Impact</p> <p>Disruptive effects: none identified</p> <p>Negligible Impact</p>	<p>Land required: 15.0ha; 12% of holding taken.</p> <p>Medium Impact</p> <p>Severance: Middleton parcel: area of land severed that cannot be accessed under the Drayton Basset viaduct (173\l1) \ headroom insufficient.</p> <p>High Impact</p> <p>Infrastructure: restoration of drainage functionality; access provision</p> <p>Low Impact</p>

Holding reference, name and description	Construction effects	Residual effects post restoration of land
<p>CFA20\11</p> <p>Parkwood House Farm</p> <p>55.4ha of Mainly arable</p> <p>Medium sensitivity to change</p>	<p>Land required: 6.2ha; 11% of holding required for construction (see opposite). Medium Impact</p> <p>Severance: access off public highway still possible. Negligible Impact</p> <p>Disruptive effects: none identified Negligible Impact</p>	<p>Land required: 5.9ha; 11% of holding taken (note that this is the vast majority of one of two outlying parcels to the main holding). Medium Impact</p> <p>Severance: access off public highway still possible. Negligible Impact</p> <p>Infrastructure: reinstatement of drainage functionality Negligible Impact</p>
<p>CFA20\12</p> <p>Crowberry Stables</p> <p>8.1ha of Equestrian (commercial)</p> <p>Medium sensitivity to change</p>	<p>Land required: 2.3ha; 29% of holding required for construction (combination of land loss, severance and noise likely to make livery business unviable). High Impact</p> <p>Severance: inaccessible severed area remains outside of construction zone High Impact</p> <p>Disruptive effects: livery business will be affected by noise Medium Impact</p>	<p>Land required: 2.3ha; 29% of holding taken (see opposite). High Impact</p> <p>Severance: headroom under 171\L1 (Langley Brook Viaduct) is insufficient to get a horse underneath. High Impact</p> <p>Infrastructure: reinstatement of water supply / drinking trough systems; restoration of drainage functionality; fencing Negligible Impact</p>
<p>CFA20\13</p> <p>Bullock End Farm</p> <p>307.6ha of General cropping (cereals and potatoes)</p> <p>High sensitivity to change</p>	<p>Land required: 17.5ha; 6% of holding required for construction (note that HS2 impacts on one of a number of outlying parcels to the main holding). Low Impact</p> <p>Severance: access to severed land will be possible off Church Lane Medium Impact</p> <p>Disruptive effects: the farm runs a carp fishery adjacent to the proposed Langley Brook viaduct Medium Impact</p>	<p>Land required: 12.2ha; 4% of holding taken (see opposite). Negligible Impact</p> <p>Severance: access to severed land will be possible off Church Lane Medium Impact</p> <p>Infrastructure: reinstatement of abstraction point / irrigation systems; restoration of drainage functionality; access provision Negligible Impact</p>
<p>CFA20\14</p> <p>Church Farm</p> <p>80.9ha of General cropping (cereals and potatoes)</p> <p>High sensitivity to change</p>	<p>Land required: 8.9ha; 11% of holding required for construction. Medium Impact</p> <p>Severance: see opposite Medium Impact</p> <p>Disruptive effects: None identified Negligible Impact</p>	<p>Land required: 5.9ha; 7% of holding taken. Low Impact</p> <p>Severance: HS2 isolates a parcel of land to the east of the alignment. New track will be needed alongside of HS2 through land owned by CFA20\13, if access is to be maintained. Medium Impact</p> <p>Infrastructure: reinstatement of abstraction point / irrigation systems; restoration of drainage functionality; access provision Low Impact</p>

Holding reference, name and description	Construction effects	Residual effects post restoration of land
<p>CFA20\15*</p> <p>Dunton Stables</p> <p>6.6ha of Equestrian (commercial)</p> <p>High sensitivity to change</p>	<p>Land required: 0.7ha; 11% of holding required for construction. Medium Impact</p> <p>Severance: land that would be severed required for construction.</p> <p>Negligible Impact</p> <p>Disruptive effects: livery business likely to be affected by noise Medium Impact</p>	<p>Land required: 0.5ha; 7% of holding taken. Low Impact</p> <p>Severance: access provided under Birmingham and Fazeley Canal Viaduct Negligible Impact</p> <p>Infrastructure: drainage and fencing Negligible Impact</p>
<p>CFA20\16*</p> <p>Land to the west of Cocksparrow House Farm</p> <p>2.3ha of Grassland</p> <p>Low sensitivity to change</p>	<p>Land required: 2.3ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Disruptive effects: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p>	<p>Land required: 2.3ha; 100% of holding taken for mitigation planting. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Infrastructure: loss of agricultural buildings High Impact</p>
<p>CFA20\18*</p> <p>Land between Barn Covert and M42</p> <p>1.6ha of Equestrian (non\commercial)</p> <p>Low sensitivity to change</p>	<p>Land required: 1.6ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Disruptive effects: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p>	<p>Land required: 1.6ha; 100% of holding taken for mitigation planting. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Infrastructure: loss of agricultural buildings High Impact</p>
<p>CFA20\19*</p> <p>Marston Fields Farm</p> <p>29.8ha of Grassland</p> <p>Medium sensitivity to change</p>	<p>Land required: 17.2ha; 58% of holding required for Kingsbury Road Railhead. High Impact</p> <p>Severances: no part of the holding is severed, despite significant land\take. Negligible Impact</p> <p>Disruptive effects: noise effects of railhead adjacent to diversified activities including carp fisheries and car boot sale. High Impact</p>	<p>Land required: 17.2ha; 58% of holding taken for mitigation planting. High Impact</p> <p>Severance: no part of the holding is severed, despite significant land\take Negligible Impact</p> <p>Infrastructure: potential reorganisation of water supply/ field trough systems Negligible Impact</p>

Holding reference, name and description	Construction effects	Residual effects post restoration of land
<p>CFA20\20*</p> <p>Land south of Bodymoor Heath Road (A)</p> <p>34.3ha of Mainly arable</p> <p>Medium sensitivity to change</p>	<p>Land required: 11.9ha; 35% of holding required for Kingsbury Road Railhead. High Impact</p> <p>Severance: strip of land adjacent to M42 severed from the remainder of land parcel. Access will be organised through CoCP. Low Impact</p> <p>Disruptive effects: none identified Negligible Impact</p>	<p>Land required: 11.5ha; 34% of holding taken for track and balancing pond. High Impact</p> <p>Severance: severance by access track and outflow from drainage pond. Assume this can be mitigated by sharing access and realigning drainage. Low Impact</p> <p>Infrastructure: restoration of drainage functionality; access provision Negligible Impact</p>
<p>CFA20\21*</p> <p>Land south of Bodymoor Heath Road (B)</p> <p>7.6ha of Mainly arable</p> <p>Medium sensitivity to change</p>	<p>Land required: 2.0ha; 27% of holding required for construction of balancing pond. High Impact</p> <p>Severance: none identified Negligible Impact</p> <p>Disruptive effects: Negligible Impact</p>	<p>Land required: 2.0ha; 27% of holding taken for balancing pond. High Impact</p> <p>Severance: none identified Negligible Impact</p> <p>Infrastructure: restoration of drainage functionality Negligible Impact</p>
<p>CFA20\22*</p> <p>Home Farm</p> <p>2.7ha of Mainly livestock (cattle)</p> <p>Medium sensitivity to change</p>	<p>Land required: none of holding required for construction. Negligible Impact</p> <p>Severance: none identified Negligible Impact</p> <p>Disruptive effects: potential disruption from construction traffic using Seeney's Lane Low Impact</p>	<p>Land required: none of holding taken. Negligible Impact</p> <p>Severance: none identified Negligible Impact</p> <p>Infrastructure: no impacts identified Negligible Impact</p>
<p>CFA20\23*</p> <p>Cocksparrow Farmhouse</p> <p>3.8ha of Equestrian (commercial)</p> <p>Medium sensitivity to change</p>	<p>Land required: 3.8ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Disruptive effects: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p>	<p>Land required: 3.8ha; 100% of holding taken for mitigation planting. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Infrastructure: loss of agricultural buildings High Impact</p>
<p>CFA20\25*</p> <p>Parklands Stud</p> <p>6.9ha of Equestrian (commercial)</p> <p>Medium sensitivity to change</p>	<p>Land required: 6.9ha; 100% of holding required for Kingsbury Road Railhead. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Disruptive effects: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p>	<p>Land required: 6.9ha; 100% of holding taken for mitigation planting. Holding made unviable. High Impact</p> <p>Severance: N.A. (whole of holding taken by Kingsbury Road Railhead) Negligible Impact</p> <p>Infrastructure: loss of agricultural buildings High Impact</p>

Holding reference, name and description	Construction effects	Residual effects post restoration of land
CFA20\26* Land adjacent to Wheatley House 2.8ha of Mainly arable Medium sensitivity to change	Land required: 1.2ha; 41% of holding required for Kingsbury Road Railhead. High Impact Severance: none identified Negligible Impact Disruptive effects: none identified Negligible Impact	Land required: 1.2ha; 41% of holding taken for mitigation planting. High Impact Severance: none identified Negligible Impact Infrastructure: reinstatement of drainage functionality Negligible Impact
CFA20\27* Land south of Parklands Stud 0.4ha of Grassland Medium sensitivity to change	Land required: 0.2ha; 54% of holding required for Kingsbury Road Railhead. High Impact Severance: none identified. Negligible Impact Disruptive effects: Low Impact	Land required: 0.2ha; 54% of holding taken. High Impact Severance: none identified. Negligible Impact Infrastructure: reinstatement of drainage functionality Negligible Impact
CFA20\28* Land south of Bodymoor Heath Road (C) 3.1ha of Mainly arable Medium sensitivity to change	Land required: 0.4ha; 12% of holding required for Kingsbury Road Railhead. Medium Impact Severance: none identified. Negligible Impact Disruptive effects: none identified Negligible Impact	Land required: 0.4ha; 12% of holding taken. Medium Impact Severance: severance by outflow from drainage pond. Assume this can be mitigated by sharing access and realigning drainage. Negligible Impact Infrastructure: reinstatement of drainage functionality. Negligible Impact

* No farm impact assessment interview conducted; data estimated.

5 References

British Geological Survey. <http://bgs.ac.uk/geologyofbritain/home/html>.

Cranfield University (2001), *The National Soil Map of England and Wales* 1:250,000 scale.

Department for Environment, Food and Rural Affairs (Defra) (2005), *Likelihood of Best and Most Versatile Agricultural Land* (1:250,000).

Forestry Commission (2001), *National Forest Inventory Woodland and Ancient Woodland (as updated)*.

Meteorological Office (1989), *Gridpoint Meteorological data for Agricultural Land Classification of England and Wales and other Climatological Investigations*.

Ministry of Agriculture, Fisheries and Food (MAFF) (1983), *Agricultural Land Classification of England and Wales* (1:250,000).

Ministry of Agriculture, Fisheries and Food (MAFF) (1988), *Agricultural Land Classification of England and Wales – Revised guidelines and criteria for grading the quality of agricultural land*.

MAGIC website <http://magic.defra.gov.uk/website/magic/viewer.htm>.

Munsell Color Charts (2000), *Munsell Color*, Grand Rapids, MI, USA.

Ragg, J.M., Beard, G.R., George, H., Heaven, F.W., Hollis, J.M., Jones, R.J.A., Palmer, R.C., Reeve, M.J., Robson, J.D. and Whitfield, W.A.D. (1984), *Soils and their Use in Midland and Western England*, Soil Survey of England and Wales Bulletin No. 12, Harpenden.